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The Pasteurization of Milk

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THE PASTEURIZATION OF MILK

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Milk is a medium in which bacteria live and multiply, and there are a number of ways in which they may enter an unguarded milk supply.

The vast number of people engaged in the production and handling of a city's milk supply makes it physically impossible for health authorities to be sure that some of the milk at some time will not come in contact with a so-called "carrier," that is, a person who unknowingly harbors organisms of a communicable disease. It is also impossible to be sure that all dairy farms are free from a polluted water supply and other sources of contamination, or that the milk from a diseased cow will not inadvertently enter the milk supply. Because of such uncertainties, a city or community that permits the general use of raw milk cannot consider itself free from the danger of milk-borne diseases.

Science, however, has developed the process of pasteurization, which, if properly performed, makes the milk supply safe for consumption and at the same time maintains the nutritive value of the milk.

STATUS OF PASTEURIZATION

The pasteurization of milk for direct consumption, as applied under commercial conditions, means a process of heating every particle of milk to a temperature not lower than 143° F. for not less than 30 minutes (holder process), or to a temperature not lower than 160°, and holding at that temperature or above for not less than 15 seconds (short-time, high-temperature process). After the milk is pasteurized, it is immediately cooled to 50° or lower.

The holder process of pasteurizing milk is the method most generally practiced today. Some cities prohibit the use of the short-time, high-temperature process.

Pasteurization is at present favorably regarded by most physicians, sanitarians, dairymen, and consumers. As a result there is a constantly increasing trend toward pasteurization throughout the United States. At present more than 85 percent of the milk supply of cities having a population above 75,000 is pasteurized. As the relative size of the city increases, the percentage of the milk that is pasteurized increases, and very little raw milk is sold in the large cities. In the smaller towns and rural districts, however, only a small proportion of the milk is pasteurized. The United States Department of Agriculture recommends efficient pasteurization as a safety measure and advocates the pasteurization of all general milk supplies.

FACTS CONCERNING PASTEURIZED MILK

Considerable opposition has attended the development of the practice of pasteurizing milk, and some opposition still exists. Most of the objections, however, have been based on theory, or on experiments and experience in which the milk has not been pasteurized under properly controlled conditions.

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[1] Now with the Dairy Branch, Production and Marketing Administration.

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One of the early objections to pasteurized milk was that heating destroyed the lactic acid-producing bacteria but not the putrefactive organisms. It was contended that these putrefactive organisms, relieved from the restraining action of the acid-forming bacteria, would develop and form toxins and putrefactive products. It is now known that pasteurized milk sours in a manner similar to that of high-grade raw milk and that there is no more reason to fear the growth of excessive numbers of putrefactive organisms in it than in any other high-grade milk. Pasteurization, however, does destroy many of the lactic acid-producing bacteria, most of which get into the milk with dirt, and this accounts for the fact that pasteurized milk usually keeps longer than raw milk.

Another contention has been that bacteria grow faster in pasteurized milk than in raw milk. Experiments, however, have shown that the rate of bacterial increase is approximately the same in raw milk and in pasteurized milk having about the same bacterial content.

It is often stated that pasteurization, even though it kills bacteria, does not destroy poisonous products of their growth. If poisonous products of bacterial growth are present in raw milk, however, and if pasteurization does not destroy them, the pasteurized milk would be no worse than the raw milk. The important point, of course, is that efficient pasteurization will kill all disease organisms that find their way into the milk, and they are certainly less dangerous when dead than when alive.

Objection to pasteurization has been based also on the supposition that it would have an unfavorable influence on the milk producer. It has been asserted that pasteurization would lead to lax methods on the farm because farmers, knowing that the milk is to be pasteurized, would be careless in its production. However, only milk of high quality should be pasteurized, and at the present time standards of sanitary quality are prescribed for raw milk that is to be pasteurized.

It has also been contended that pasteurization may be carelessly done and therefore that it is not infallible. A study of the milk-borne epidemics of disease shows that even in the early days of pasteurization, pasteurized milk was safer than raw milk. Moreover, the present practice of official inspection in all pasteurizing plants greatly reduces the likelihood that the process will be carelessly performed.

The question of whether pasteurization destroys beneficial enzymes is still open. In the light of the present knowledge of the enzymes in milk and the part they play in the digestive process, it is quite impossible to settle the question of their importance. There is no evidence, however, that present methods of pasteurization destroy any beneficial enzyme.

It is frequently stated that vitamins are destroyed by pasteurization and if this were so it would be important, especially in infant feeding. Of the several vitamins present in milk only one, vitamin C, which prevents scurvy, is impaired. However, milk is ordinarily such a poor source of this vitamin that when used as the only food as in the case of babies it should be supplemented with antiscorbutics such as orange juice or some other suitable fruit juice.

Serious objections have been raised to pasteurized milk on the theory that the heating produces chemical changes that render the milk less digestible, particularly for infants. Feeding experiments with babies, in which some were fed raw milk and others pasteurized milk, have shown there was only a slight difference in the average net daily gain in weight during the feeding period. The slight difference was in many cases in favor of the pasteurized milk.

Consumers sometimes object to pasteurized milk because of a cooked taste. If a cooked taste occurs, it is due to overheating or to heating too rapidly. Properly pasteurized milk is equal to raw milk in flavor. With present apparatus for pasteurizing milk, temperatures can be so controlled that the flavor is not affected.

It has also been stated that pasteurization reduces the cream line. When this occurs, it is due to overheating. In experimental work, milk heated to 143° F. for 30 minutes showed practically no decrease in the cream volume, and in some cases an increase resulted. Moreover, a slight reduction in the cream line would not mean that any cream had been taken out of the milk.

The fact that pasteurization increases the cost of milk is a frequent argument against pasteurizing milk. When milk is pasteurized in large quantities the cost is but a fraction of a cent a quart. Naturally the smaller the quantity of milk handled, the greater the overhead, and therefore the cost may rise to approximately a cent a quart. From the standpoint of safety, efficiently pasteurized milk as compared with the same milk in its raw state is easily worth a cent or two a quart more. The additional cost of pasteurized milk is cheap insurance against milk-borne diseases.

It is frequently stated that pasteurization is unnecessary in the country, where milk goes directly and promptly from producer to consumer. The fact that a large proportion of the epidemics of milk-borne disease occur outside of the large cities and that a large percentage of these epidemics have had their source on the farms, shows that pasteurization is as necessary in the country as in the city.

HOME PASTEURIZATION

Where pasteurized milk cannot be obtained, it is possible to pasteurize it at home by either one of two methods.

The milk may be pasteurized in regular milk bottles as follows: Remove the cover from one bottle, pour out a little of the milk, punch a hole in the cover, replace the cover, and insert a thermometer. Then set all the bottles of milk on a rack in a pail filled with cold water nearly to the top level of the milk and heat until the thermometer in the milk registers 145° F. Remove the pail from the heat and leave the bottles in the hot water for 30 minutes, reheating if that is necessary to keep the milk at 145°. After the 30-minute period, replace the hot water gradually with cold water until the milk has cooled, preferably using ice in the last water. After cooling, keep the milk in the coolest place available.

Another way to pasteurize milk at home is to pour the milk into a vessel (preferably aluminum), insert a thermometer in the milk, and place the vessel over a hot fire and heat until the thermometer in the milk reaches 165° F., stirring the milk constantly. Then immediately set the vessel in cold water and continue stirring the milk until it is cool. After cooling, keep the milk in the coolest place available.

NECESSITY FOR PASTEURIZATION

The value of pasteurization is greatest when applied to the general milk supply. The pasteurization of milk, when the process is properly performed, affords protection against pathogenic organisms. There have been reported in the United States numerous outbreaks of typhoid and paratyphoid fever, diphtheria, septic sore throat, scarlet fever, dysentery, and gastroenteritis traceable to raw milk. Investigators have shown that the thermal death point of pathogenic bacteria ordinarily found in milk is relatively low and that where epidemics have been due to milk, efficient pasteurization was effective in controlling the spread of the epidemic through the agency of milk. Furthermore, it is known that certain diseases of the cow may be transmitted through the milk to human beings. Among human diseases so transmitted are tuberculosis and undulant fever. It is therefore absolutely essential to have a method of rendering the general milk supplies safe. Pasteurization is that safeguard.

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